Central Puget Sound
Regional Fare Coordination System

KT Installation Procedure - Arboc 29'

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1 Introduction

This is an Installation Procedure manual for the Arboc bus at Kitsap Transit (KT). It is intended to show installation technician(s) where and how to mount all devices that are part of the RFCS, and install all cabling required ensuring correct and reliable system operation.

There are six pieces of equipment that make up the RFCS installation on the bus.

- **The On-Board Fare Transaction Processor (OBFTP):** This is the master device in the system; it is the device that contains the smart card reader and is the interface to the customer.
- **The Driver Display Unit (DDU):** This device provides an interface to the Operator. It is used to input such information as passenger counts, route information, and other data, as well as display messages on screen for operator viewing.
- **The Wireless Data On/Off Loading System (WDOLS):** This is the device that changes the data from a Category 5 input to a 2.4GHz wireless signal and vice versa. There are two parts to the WDOLS system:
    - The power injector - both the Ethernet and power cables plug into this unit as inputs. The outputs of this unit power the Cisco 1310 Bridge/Access Point.
    - The Cisco 1310 Access Point/Bridge - the power injector cables plug into the inputs to this unit. The antenna (see below) plugs directly to the output of the unit (reverse BNC).
- **The Antenna:** An upgraded external antenna is fitted to the WDOLS unit to allow for an omni-directional signal to be transmitted and received.
- **The Ethernet Switch:** This small device acts as a junction for the three Category 5 cables that come from the OBFTP, DDU, and WDOLS. The above devices are connected together using Category 5 cabling.
- **The Load Dump Module (LDM):** This device provides protection to the equipment from voltage transients and spikes that may be caused by the bus electrical system.

1.1 Purpose

The purpose of this installation guide is to describe the position and methods of mounting the above devices. It will clearly show how and where all necessary cabling will be installed for correct and reliable operation.

1.2 Overview

The locations detailed herein, drawings, and photographs will serve to describe to the installer the following:

- Where and how to mount the equipment
- The location of attachment points for power
- All details on cable connectors in the Installation Connectivity Matrix
- All details on cable routing

1.3 Terminology

This section contains a list of acronyms, abbreviations, and terms used in this document.

Table 1 contains the acronyms and abbreviations that are specific to ERG. Industry standard acronyms and abbreviations are not defined in this table.

Table 1: Acronyms and Abbreviations

Acronym or Abbreviation	Definition
RFCS	Regional Fare Coordination System
ERG	ERG Transit Systems (USA) Inc.
DDU	Driver Display Unit
KT	Kitsap Transit
LDM	Load Dump Module
OBFTP	On-Board Fare Transaction Processor
WDOLS	Wireless Data On/Off Loading System

1.4 References

[1] Contract 229944, as amended and conformed

[2] SEA-02088 Generic On-Board Installation Instruction

1 Device Installation Procedures – Arboc

All Arboc buses at KT have the same installation procedures. The position and method for mounting the devices and antenna, and for running all the cables, are the same for all Arboc buses.

1.1 Driver Display Unit (DDU) Mounting

The DDU is mounted to an aluminum radio box as shown in Figure 1. The KT radio will mount inside the radio box. The aluminum plate will be mounted to the DDU plate that has been installed during the manufacture of the coach.

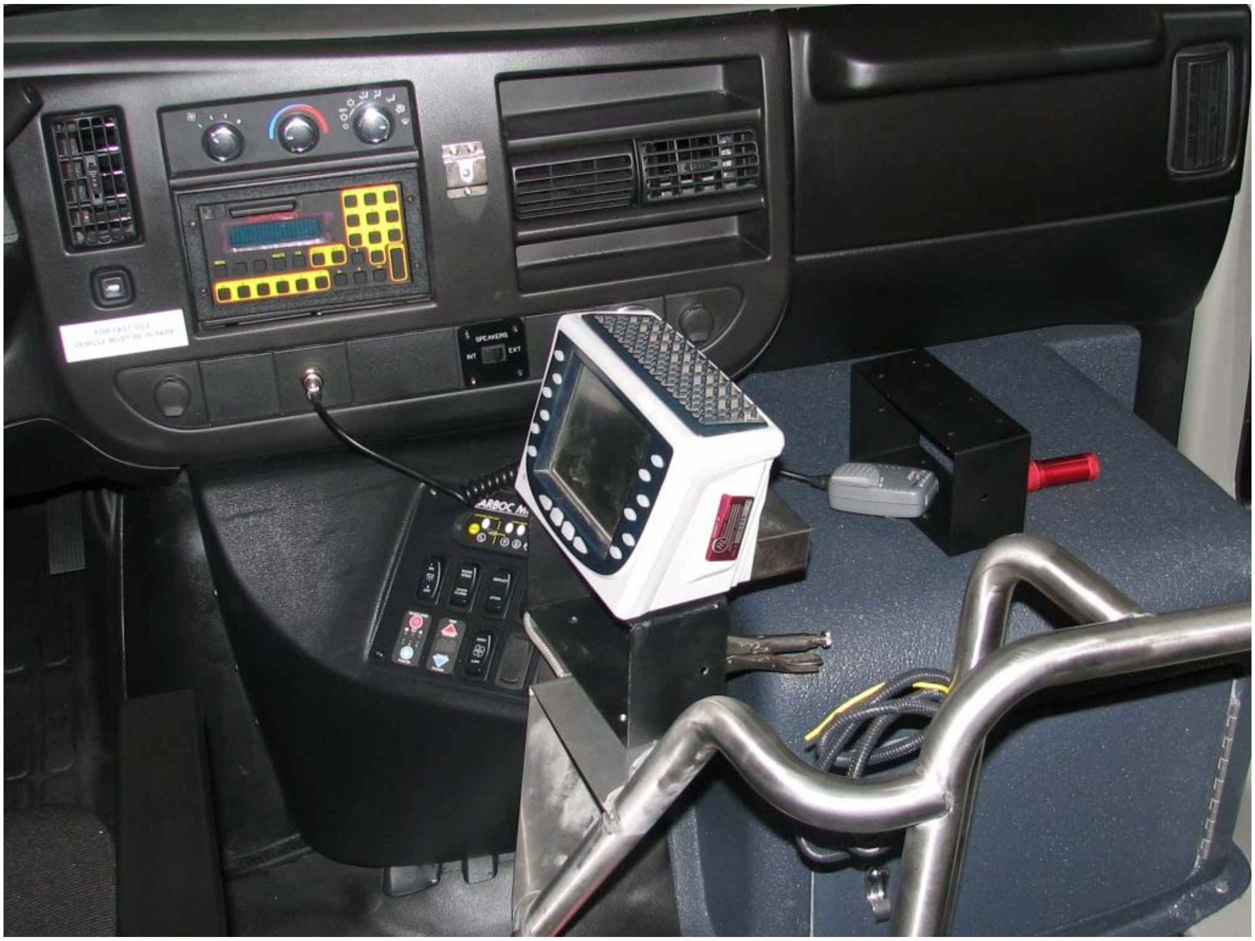

Figure 1: DDU Location

1.1.1 DDU Bracket and Cradle Installation

1.1.1.1 Fitting DDU Bracket to DDU mount

Secure the DDU bracket to the DDU mount through pre-drilled holes, using M5x10 countersunk screws and nyloc nuts.

1.1.1.2 Fitting DDU Cradle to DDU Bracket

1. Seat the DDU cradle onto the DDU plate. The plate is pre-drilled to make installation easier. The DDU cradle holes should match with the DDU bracket plate holes. If the holes do not match, either the DDU cradle or DDU bracket top plate has been pre-drilled incorrectly and should be replaced. Determine the defective part and quarantine.
2. Secure the DDU cradle to the top plate with M5x10 countersunk screws and nyloc nuts. Do not overtighten nuts. Ensure true and secure fitment of cradle to plate.

1.1.1.3 DDU Installation to DDU Cradle

Place the DDU onto the DDU cradle as shown in Figure 1. Lock the DDU to the cradle using the key provided.

1.2 On-Board Fare Transaction Processor (OBFTP) Mounting

The OBFTP mounting position and method were chosen to be on the left side of the passenger boarding the bus (see Figure 2). A mounting bracket that is suited to vertical stanchions will be used to secure the OBFTP on the vehicle. This mounting bracket will be secured directly to the existing vertical tubing on the bus.

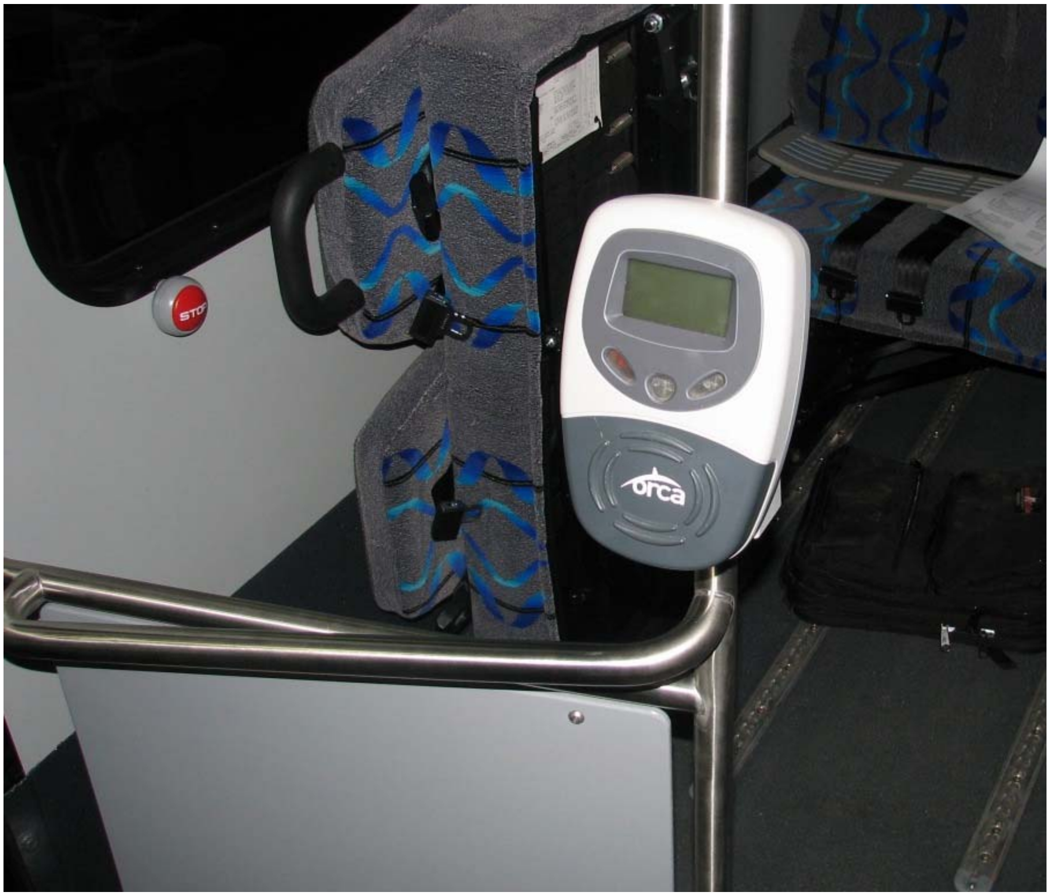

Figure 2: OBFTP Location

1.2.1 OBFTP Bracket/Cradle Mounting

1.2.1.1 Fitting OBFTP Bracket to Vertical Hand Rail

1. Remove the center locating screw from the OBFTP bracket. Position the bottom of the OBFTP bracket 36 inches from the floor on the vertical hand rail.
2. Mark the location of the hole for the locating screw to bolt into the stanchion by punching a mark through the hole as shown in Figure 3.
3. Mark the location for the hole for the cable to exit the vertical hand rail and enter the OBFTP bracket by punching a mark in the center of the cutout of the bracket. The cables will run from the overhead compartment into vertical post.

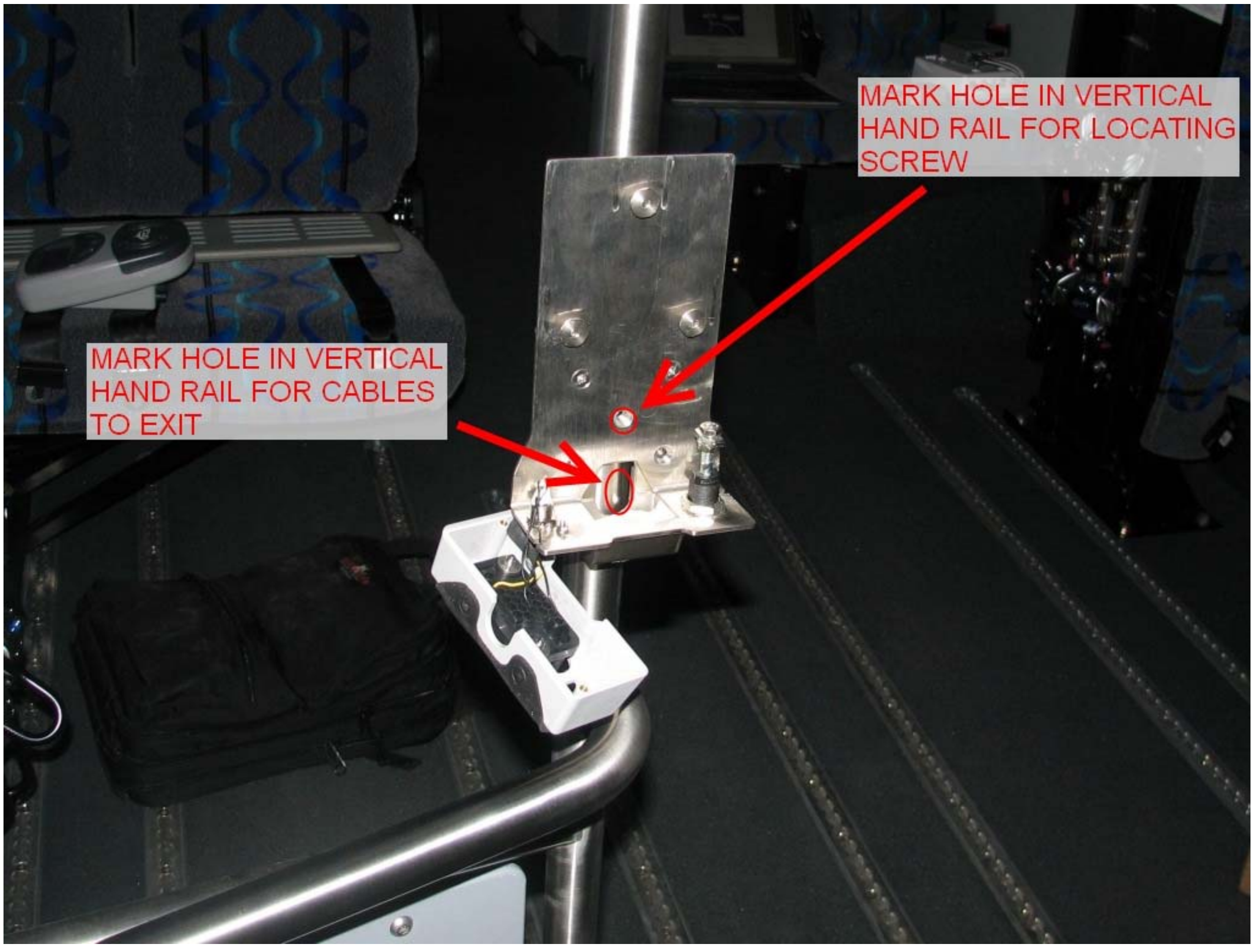
MARK HOLE IN VERTICAL HAND RAIL FOR LOCATING SCREW
MARK HOLE IN VERTICAL HAND RAIL FOR CABLES TO EXIT

Figure 3: OBFTP Mounting Bracket Detail

4. Drill the required holes:
   a. Drill a 13/64” hole through the vertical handrail where the locating screw will penetrate the vertical hand rail.
   b. Drill a 3/4” hole in the forward side of the vertical handrail where indicated to allow cables through. De-bur and insert the grommet edging provided.
   c. Drill an 11/16” hole in the overhead fiberglass panel to allow cables to enter the roof cavity.

d. Drill an 11/16" hole in the overhead panel clamp to allow cables to pass through and enter the roof cavity. Fit grommet edging to the clamp.

5. Fit the OBFTP clamping bracket to the vertical hand rail section as shown in Figure 3. Tighten four Philips screws that hold the clamp in place and fit the locating screw to secure the unit.

Note: Do not assemble the vertical hand rail assembly or the OBFTP bracket until the cabling is complete to the OBFTP bracket (see cabling procedures in section 2).

1.2.1.2 Fitting OBFTP to Bracket

Fit the OBFTP to the OBFTP bracket as shown in Figure 2 and secure the device using the key provided.

1.3 WDOLS, Ethernet Switch, and Antenna Mounting

The WDOLS will be mounted in the overhead compartment and secured to the KT provided mounting plate (see Figure 4). The Ethernet Switch will also be mounted in this location. The antenna will mount in the front center of the bus on the roof.

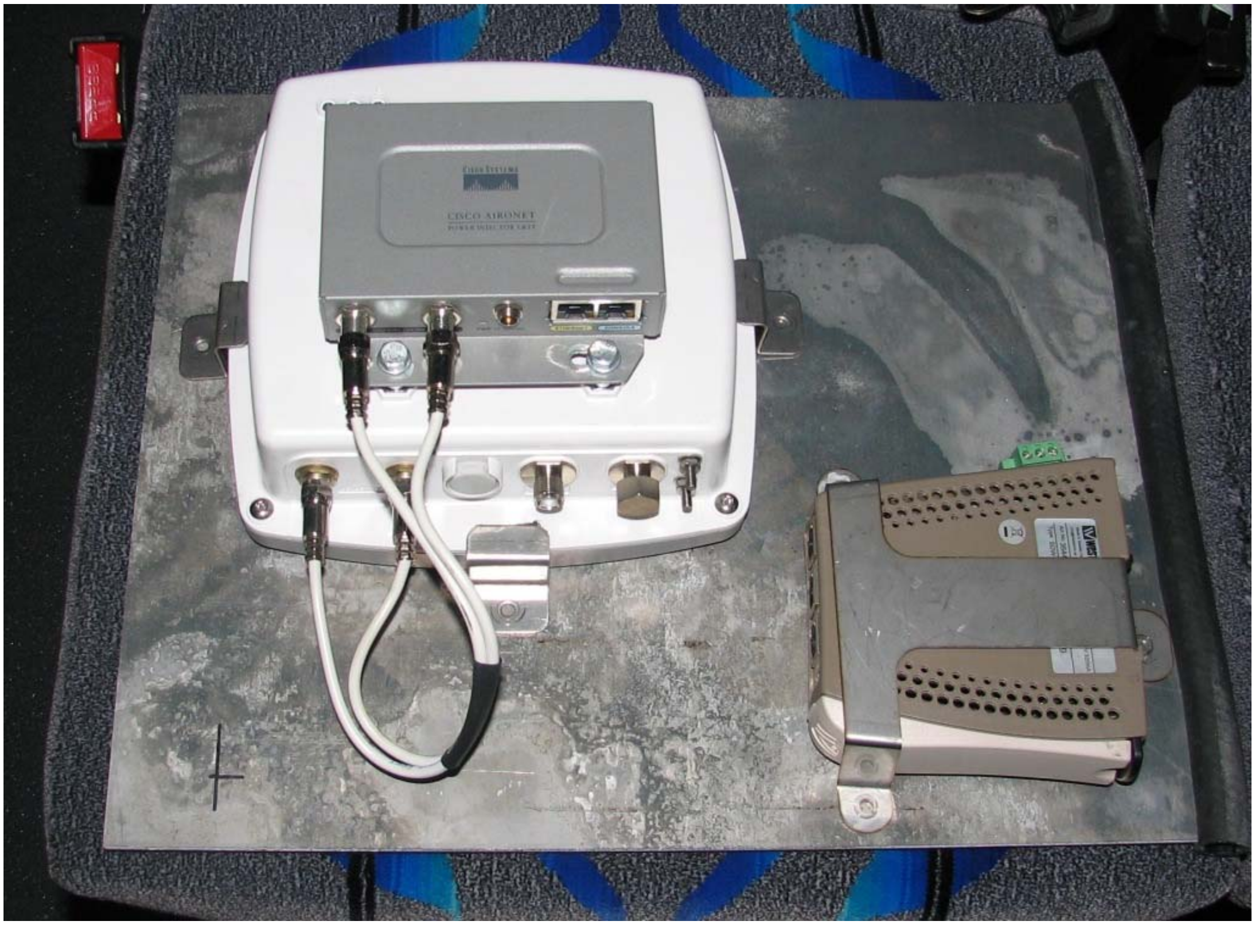

Figure 4: WDOLS and Ethernet Switch Location

1.3.1 Antenna Mounting

The antenna will mount on the roof of the bus. The antenna will route from the WDOLS through the space in the overhead compartment as Figure 5 shows.

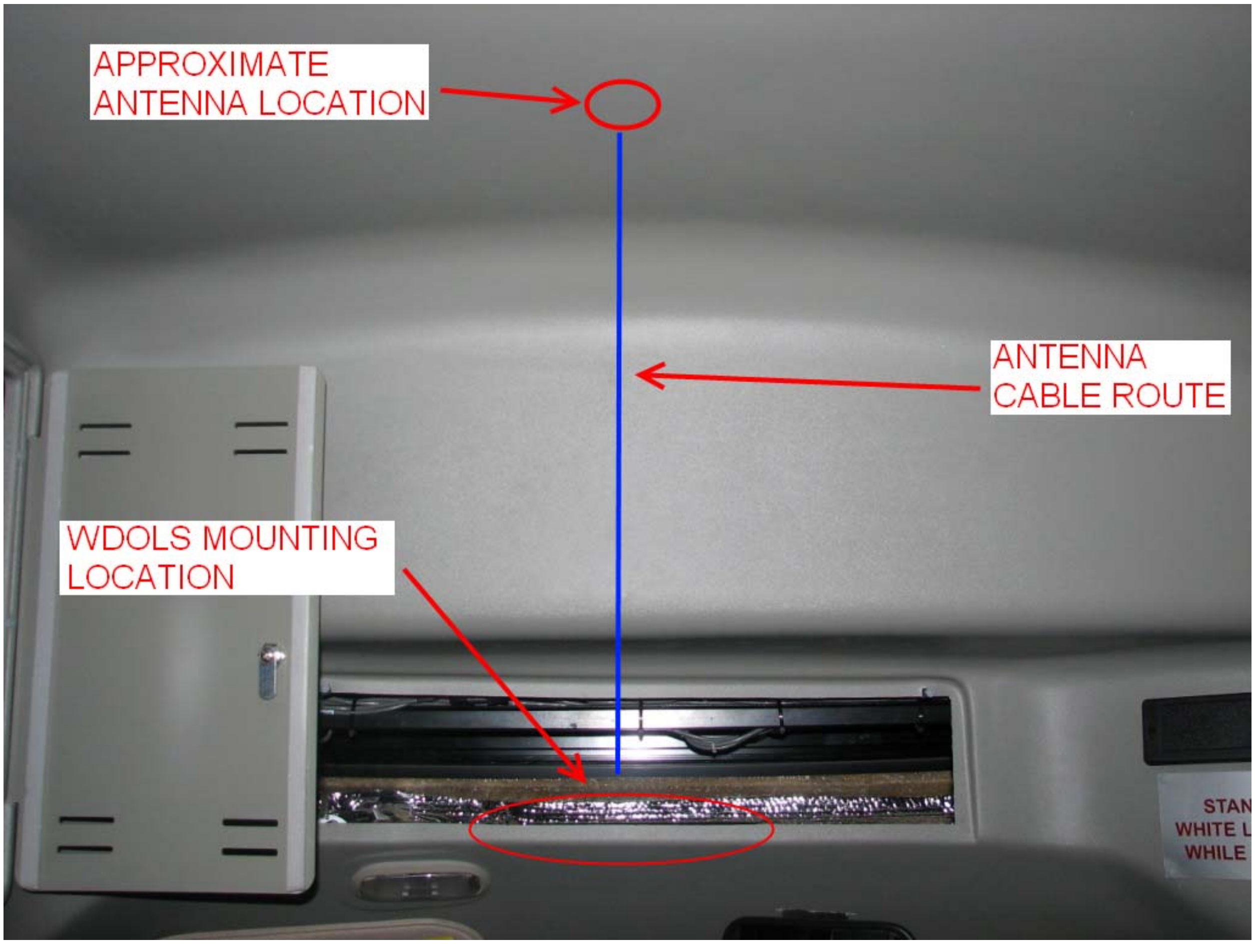

Figure 5: External Antenna Location

1.3.1.1 Installation of Antenna

1. Carefully mark a circle in the roof with a marker. Punch a mark.
2. Drill a 5/8” hole through the roof of the bus. Use a pilot drill where necessary.
3. From the roof of the bus, de-bur the hole with a de-burring tool or round file. Insert the antenna cable through the hole and feed through until the antenna sits firmly against the roof. Ensure that the rubber seal is intact. Seal the antenna using appropriate sealer.
4. First, slide the lock washer and then the nut over the cable end and run along cable to the antenna thread. Tighten the nut.

1.4 Load Dump Module (LDM) Mounting

The LDM is secured by two screws.

1. Position the LDM as shown in Figure 6.

2. Mount the LDM with two 10/32 x 2 1/2-inch machine screws

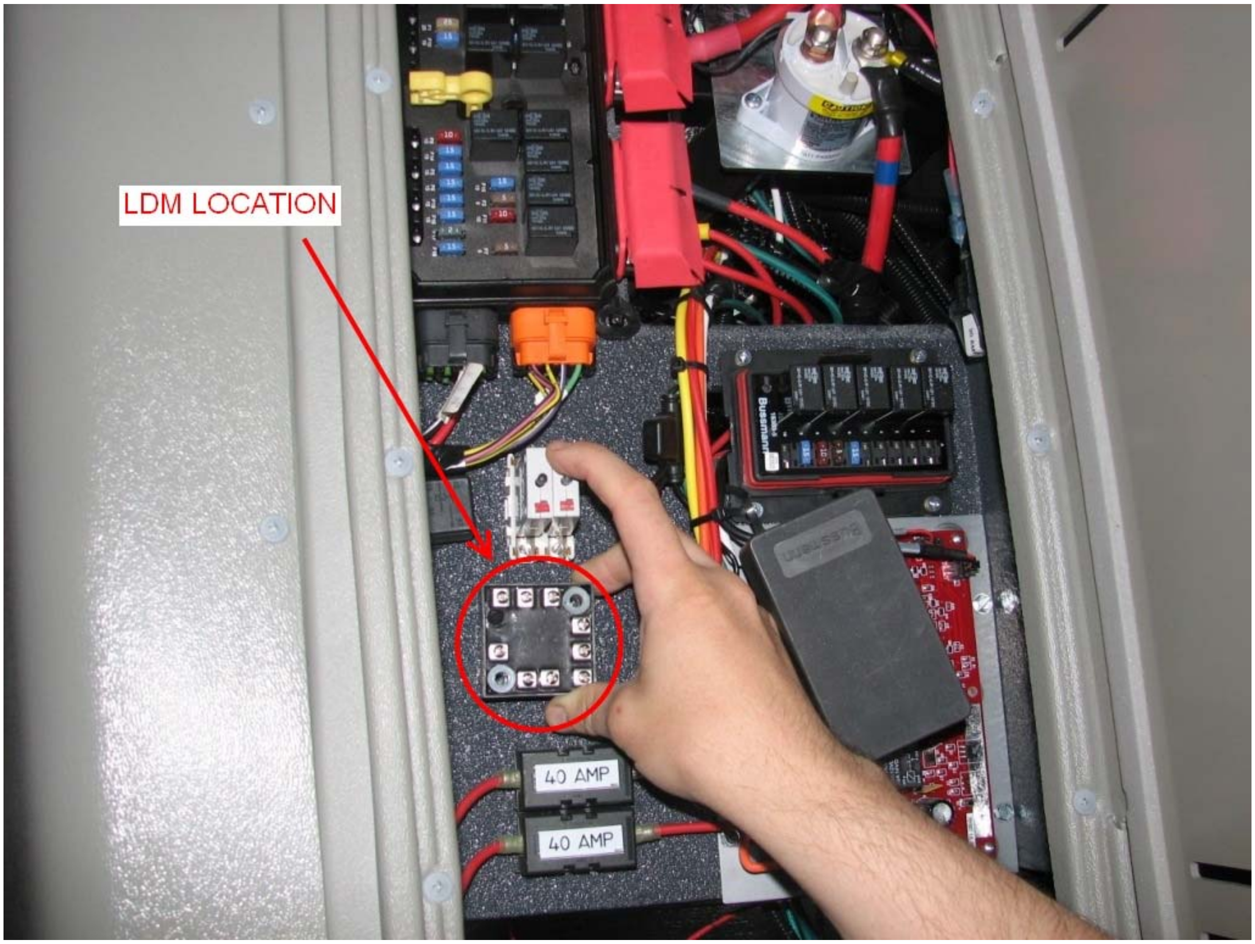

Figure 6: Load Dump Module Mounting Location

2 Cabling Installation Procedures – Arboc

All Arboc buses at KT share the same cabling requirements for power and communications.

Power Cable Lengths:

Circuit Breaker to LDM	1 ft
DDU to LDM	14ft
OBFTP to LDM	18ft
WDOLS to LDM	8 ft

Ethernet Cable Lengths:

DDU to Ethernet Switch	10 ft
OBFTP to Ethernet Switch	16 ft
WDOLS to Ethernet Switch	3 ft

Antenna Cable Length (supplied with antenna): 6 ft

2.1 Circuit Breaker and Load Dump Module Installation

Two inline circuit breakers will be fitted to the bus. One breaker is fitted to the constant +12V rail, and the other breaker is fitted to the ignition (switched) +12V rail. KT supplied 10 Amp inline fuses will be installed at the power taps prior to the connection to the 1 and 4 amp circuit breakers. Figure 7 shows where the power will be taken to supply power to the LDM. Figure 8 shows where ground will be taken for the connection to the LDM. Power for the DDU, OBFTP, WDOLS, and Ethernet Switch are taken from connections on the LDM. Figure 9 shows the wiring of the LDM.

1. Install the cable to the power stud locations shown in Figure 7 using ring terminals.
2. Install the cable to ground from the location shown in Figure 8. This stud is located in the panel above and behind the driver seat.
3. Insert the constant power cable into the 4-amp breaker and ignition power into the 1-amp breaker.
4. Run the constant power cable from the 4-amp breaker to the LDM and terminate the cable with ring terminals. Attach cables to input terminals on LDM.

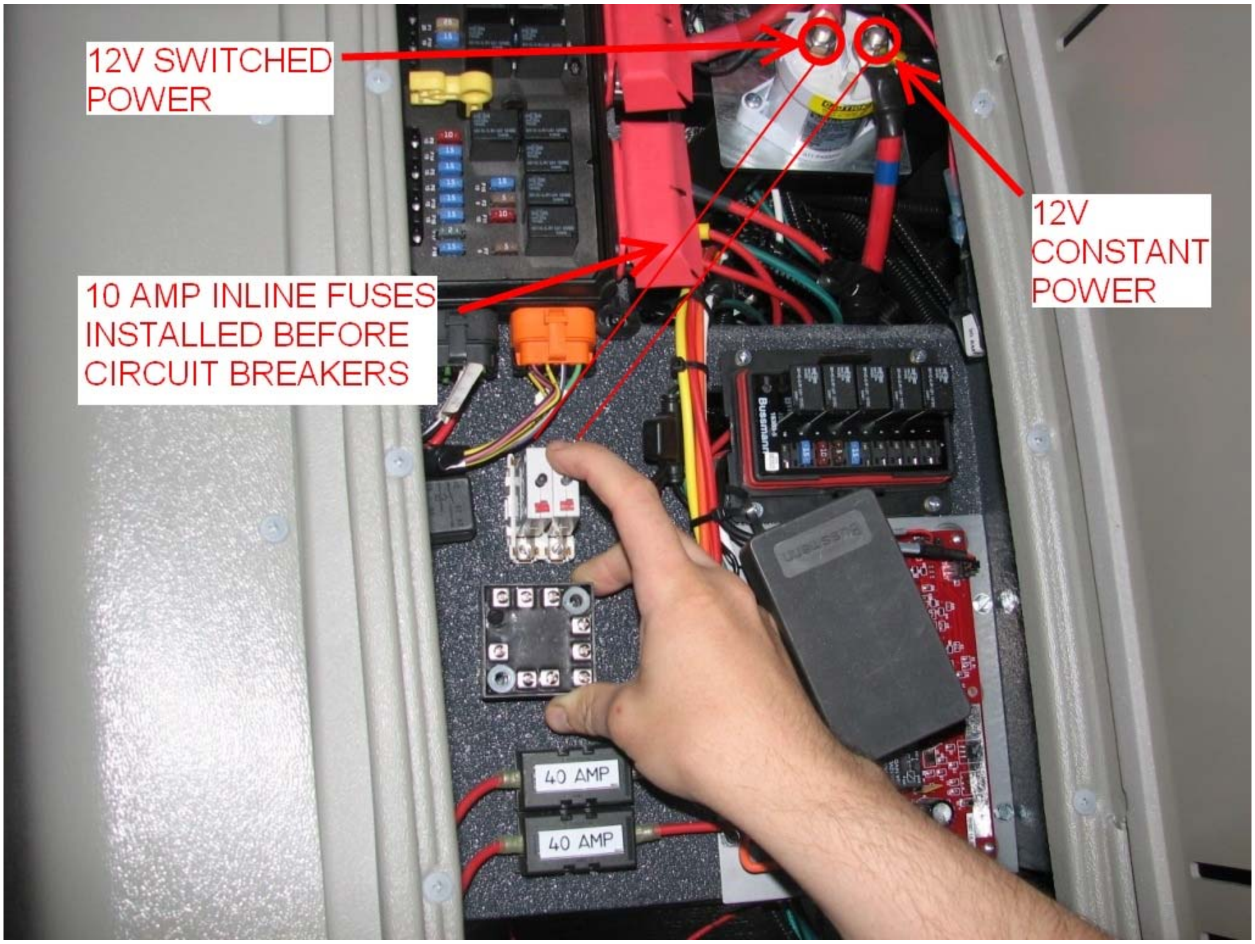

Figure 7: Power Stud Locations

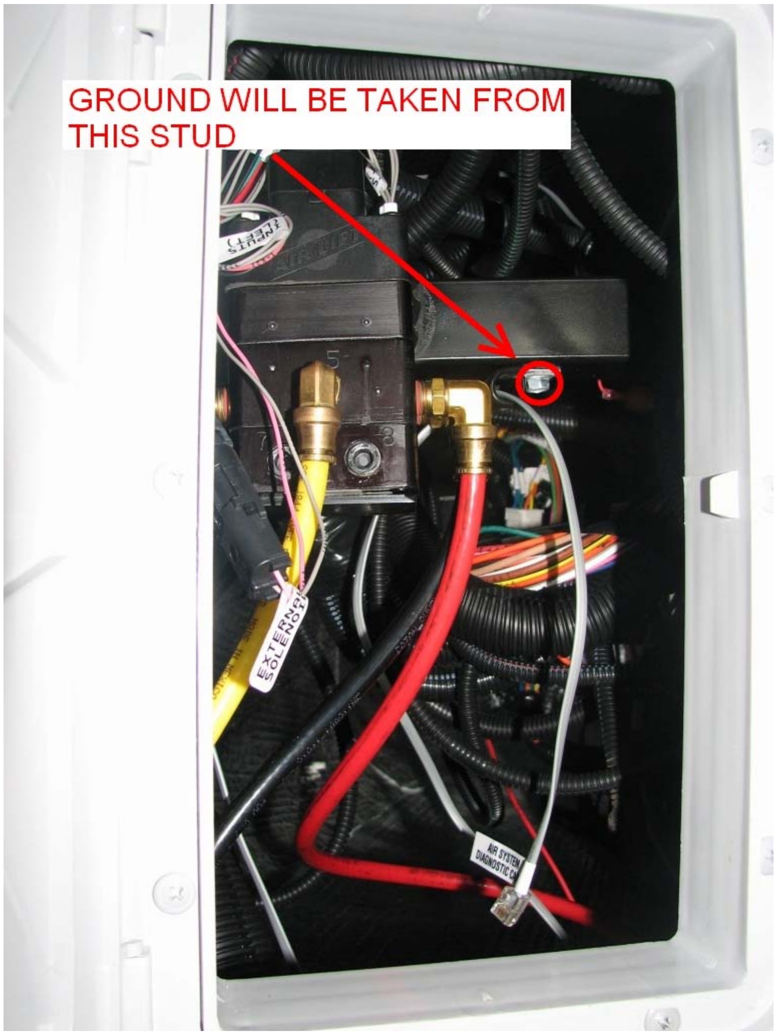

Figure 8: Ground Location

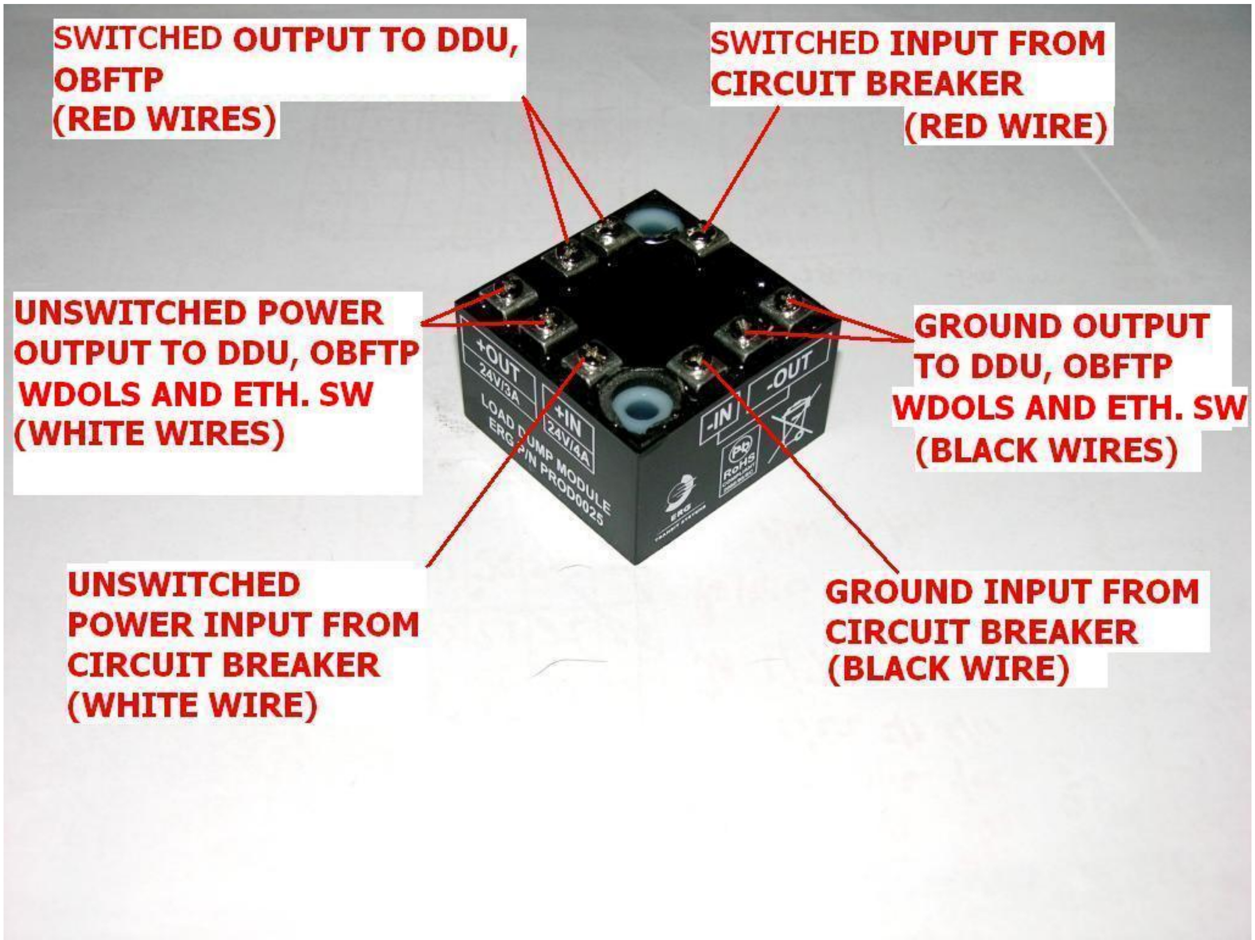
SWITCHED OUTPUT TO DDU, OBFTP (RED WIRES)
SWITCHED INPUT FROM CIRCUIT BREAKER (RED WIRE)
UNSWITCHED POWER OUTPUT TO DDU, OBFTP WDOLS AND ETH. SW (WHITE WIRES)
GROUND OUTPUT TO DDU, OBFTP WDOLS AND ETH. SW (BLACK WIRES)
+OUT 24V/3A
+IN 24V/4A
-IN
-OUT
LOAD DUMP MODULE ERG P/N PROD0025
RoHS
UNSWITCHED POWER INPUT FROM CIRCUIT BREAKER (WHITE WIRE)
GROUND INPUT FROM CIRCUIT BREAKER (BLACK WIRE)

Figure 9: LDM Wiring Diagram

2.2 DDU Cabling Installation

2.2.1 Power and Ethernet Cabling

Run both of the cables (power and Ethernet) through the split loom from the DDU bracket to a 3/4” hole drilled in the dash (see Figure 10). Ensure that the cables are tied to existing looms and anchored as necessary.

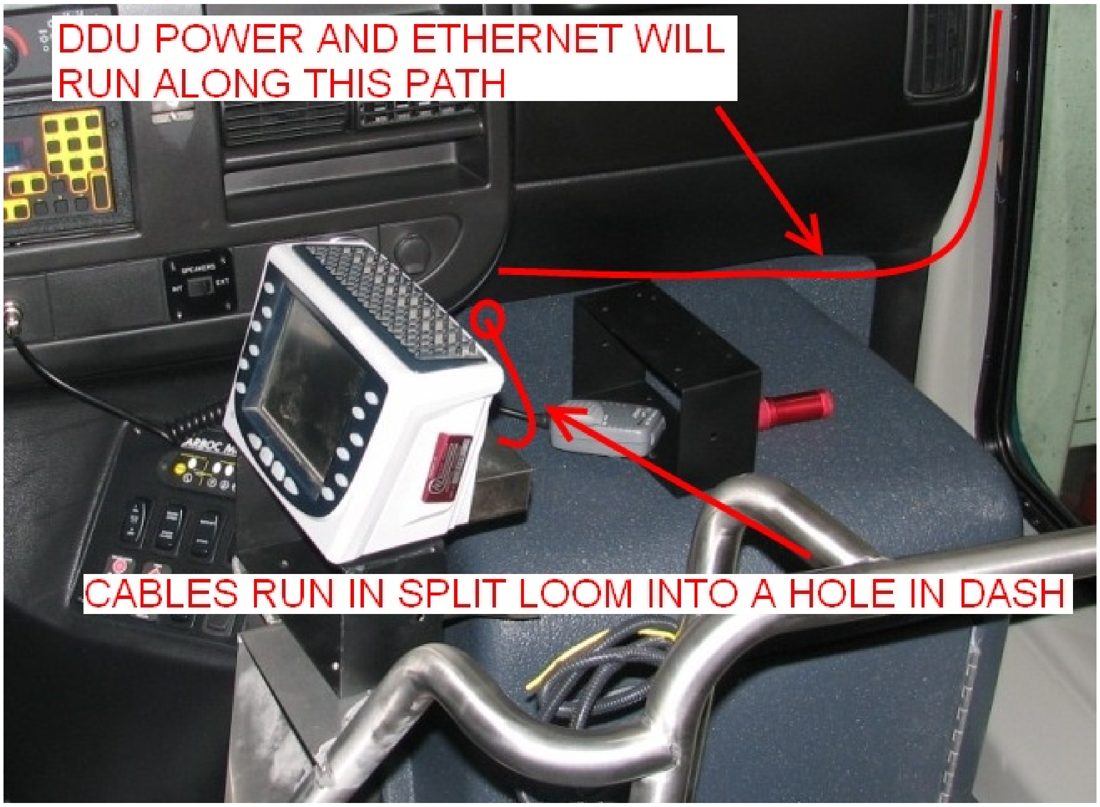
DDU POWER AND ETHERNET WILL RUN ALONG THIS PATH
CABLES RUN IN SPLIT LOOM INTO A HOLE IN DASH

Figure 10: DDU Power and Ethernet Cable Routing

1. Run the Power and Ethernet cable underneath the dash and across to the right side of the bus. The cables run up the side of the bus behind the paneling as shown in Figure 10.
2. Continue to route the Ethernet cable into the overhead cavity where the connection is made to the Ethernet Switch. Power will continue through the overhead panel and connect to the LDM.
3. Terminate the Ethernet cable as described in SEA-02088 Generic On-Board Installation Instruction [2].
4. Terminate the power and Ethernet cable at the DDU cradle as described in SEA-02088 Generic On-Board Installation Instruction **Error! Reference source not found.**.

2.3 OBFTP Cabling Installation

As described in section 1.2.1.1, the cables should be run for the OBFTP before the vertical stanchion and OBFTP bracket are secured.

2.3.1 Power and Ethernet Cabling

1. The power cable should be run from the ignition circuit breaker and LDM across to the overhead compartment following the DDU Ethernet cable route as previously explained.
2. Run the power cable and also the Ethernet cable (from the Ethernet Switch) down through the previously drilled vertical post. Fit the split loom to cables at the point of entry into the vertical hand rail. Cables will follow the path shown in Figure 11.

3. Ensure that the hole in the hand rail at the OBFTP bracket has grommet edging installed. Carefully draw the cables through the vertical hand rail and fit the OBFTP clamping bracket to the vertical post.
4. Terminate the Ethernet cable to the Ethernet Switch as described in SEA-02088 Generic On-Board Installation Instruction [2].
5. Terminate the power and Ethernet cable at the OBFTP cradle as described in SEA-02088 Generic On-Board Installation Instruction [2].

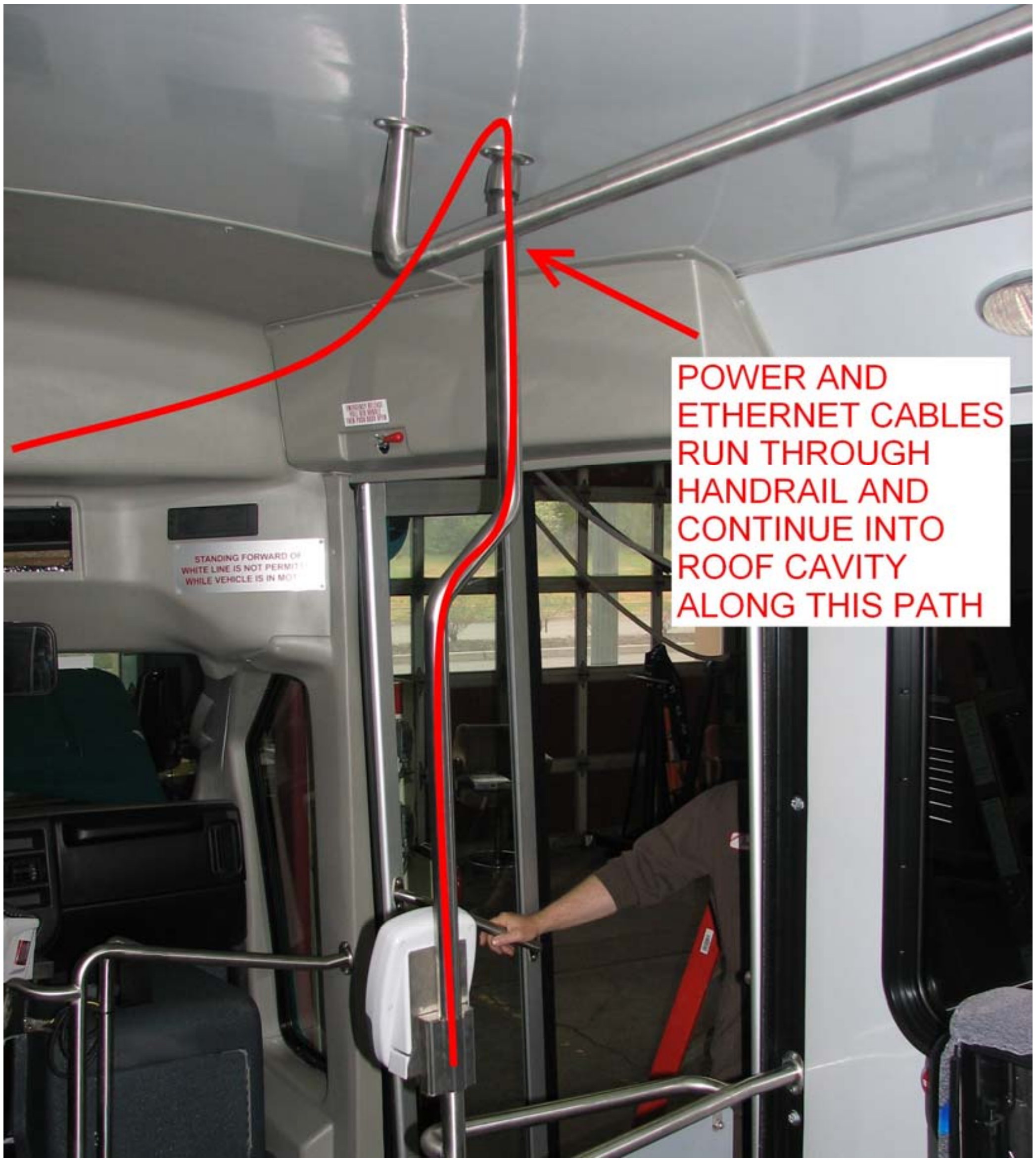
POWER AND ETHERNET CABLES RUN THROUGH HANDRAIL AND CONTINUE INTO ROOF CAVITY ALONG THIS PATH
STANDING FORWARD OF WHITE LINE IS NOT PERMIT WHILE VEHICLE IS IN MO

Figure 11: OBFTP Power and Ethernet Cable Route

2.4 WDOLS and Ethernet Switch Cabling Installation

Power for the WDOLS and Ethernet Switch will be run from the LDM; one cable from the LDM will supply power for both the Ethernet Switch and the WDOLS. A short Ethernet cable will be used to join the Ethernet Switch to the Cisco Power Injector.

2.4.1 Power and Ethernet Cabling

1. Run the power cable from the LDM to the Ethernet Switch. Terminate the cable in the Ethernet Switch connector, and run an additional three feet of cable from the connector to the WDOLS. Terminate the WDOLS power connector and insert the connector into the Cisco Power Injector.
2. Cut three feet of Ethernet cable and terminate to the specifications detailed in SEA-02088 Generic On-Board Installation Instruction [2].

2.4.2 Antenna Cabling

After the antenna is installed, route the cable from the overhead access panel along the roof cavity to the WDOLS mounted on the overhead panel.